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Abstract

There is pressure to increase female representation on corporate boards. A number of studies have found no, or in some cases a negative, effect of female representation on boards and firm performance. We demonstrate robust positive and economically meaningful effects on firm performance of female representation on European boards. Moreover, while previous work has considered female representation broadly, we focus on membership of committees involved explicitly in firm governance. We demonstrate marked, larger, effects on performance of having female representation on these committees. Finally, we reconcile this evidence with prior US and UK evidence and demonstrate a positive performance impact of female committee memberships. Our evidence is supportive of the expansion of female involvement in corporate governance from a financial performance perspective.

Key Words: Board of directors, Female director, Diversity, Performance

JEL Codes: G30, G34, J16

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1 Introduction

Board gender diversity has become a salient issue for firms and policy makers. In part this reflects basic principles of social equity. While the share of female employment in large firms has increased dramatically, this has not been reflected in the gender composition of executive boards. In addition, proposals to increase the number of female directors are premised upon the idea that this will be beneficial for governance, and ultimately, firm performance. Together, these views have been at the heart of a number of reforms aimed at increasing female representation on executive boards. These range from the requirements in the United States, as well as in the European Union (EU), for firm disclosure of their gender diversity policy in board recruitment, through to enforced gender quotas in Norway. Gender diversity has also become an important criterion for institutional investment and listings by such socially responsible indices as the FTSE4Good Index and the Domini 400 Social Index.

Despite this increased focus, there is little evidence on the performance-impact of female representation on corporate boards. The evidence that exists for the US and the UK is not supportive of a positive effect of female board representation. For instance, using a sample of US firms, Adams and Ferreira (2009) in fact find a negative impact of having females on the board on firm performance, despite better attendance records and more effective monitoring in firms with more gender-balanced boards. While for the UK, Gregory-Smith, Main and O'Reilly (2014) find no evidence that the gender composition of the board affects firm performance.

One issue is that the focus on representation may miss the actual issue of female integration into firm governance.. While regulatory and institutional pressures can lead to appointments of female directors on the board, they do not ensure the participation of appointed female directors in the governance mechanism. For any director to add value, they need to be appointed to positions in which they can influence governance, and consequently

firm performance. Moreover, the economic implications of board gender diversity may be ambiguous if decisions to increase female representation on boards are, in part, driven by social and political pressures, i.e. token representation. In this sense, female directors can add value if and only if there are enabling mechanisms within the board to facilitate that.

We return to this issue examining data from large European firms. This setting is advantageous due to the historically higher gender board representation in many European countries when compared to the US and the UK. The majority of studies on the impact on firm performance of gender-diverse boards are based on samples of firms with female representation is limited to at most a couple of individuals. This is an important point as estimates derived from these settings effectively provide the effect of appointing the first female director (O'Reilly and Main, 2012; Torchia, Calabrö, and Huse, 2011). It is difficult to extrapolate the effect of moving towards more equal gender representation from these settings where the proportion of female directors in the median firm is zero. In our setting over 50% of our sample firms have more than one female director, while about 10% of boards are gender-balanced. This allows us to more adequately address this issue.

The paper examines the performance gains from integrating female directors in the governance mechanism, over and above representation. Directors who sit on key committees are more likely to influence governance and strategy (Adams and Ferreira, 2009). The representation of female directors on the board, without involvement in key committees, is unlikely to have a marked impact on governance, and reveals little about the potential effect of female directors in firm performance. It has been suggested that a critical mass of female directors is necessary to influence governance (Torchia et al. 2011; Schwartz-Ziv 2015). For instance, Schwartz-Ziv (2015) finds that Israeli firms with at least three female directors have better corporate governance outcomes than firms with a single female director.

We examine the performance impact of female representation on corporate boards in

two ways. First, we focus on the fraction of female directors on the board. Employing a sample of large European firms in which the female representation on corporate boards is more variable than that in US, and UK samples. Second, we examine the effect of female directors on key governance committees (viz. Audit Committee, Nomination Committee, and Remuneration Committee). This allows us to examine the impact of female directors on firm performance when they are in a position to influence the governance mechanism. The central finding of this paper is that while female representation on corporate boards has a modest performance impact, female representation on key corporate governance committees is more economically meaningful. One standard deviation increase in the proportion of female directors on committees enhances firm performance by 0.6 of a standard deviation. In comparison, a one standard deviation increase in female board representation increases firm performance by 0.18 of a standard deviation. The implications are important and twofold. First, appointing female directors on the board in response to regulatory pressure has, at best, a limited effect on firm performance (Adams and Ferreira, 2009; Gregory-Smith et al. 2014). Second, the appointment of female directors to governance committees is indicative of a flexible board that includes high ability individuals in the governance mechanism to enhance firm performance. Finally, we seek to explicitly reconcile our results with other evidence for UK and US firms.

The rest of the paper unfolds as follows: Section 2 reviews relevant literature on the gender composition of corporate boards, Section 3 introduces the sample and the estimation methods employed for the analysis, Section 4 presents the results and Section 5 concludes.

2 Female representation on corporate boards

The existing evidence on board composition focuses primarily on the equity and the productivity impacts of female representation. Arguments in favour of increased representation of women on corporate boards traditionally stem from concerns about discrimination and moral justice. A key point of contention is the upward trend in female participation in the labour force (Black and Juhn, 2000). Whereas, even though females in the top US executive ranks tripled between 1992-1997, they still represent a very small proportion of the total female workforce (Bertrand and Hallock, 2001). The apparent incongruence of female representation on boards and female representation in the labour force could be due to supply constraints, statistical discrimination, or a combination of both. Disentangling these channels is empirically difficult, largely because all applications for directorships are not publicly observed. Powell and Butterfield (1994) argue that discriminatory practices hinder the career progression of equally qualified women on to corporate boards. Farrell and Hersch (2005), and Gregory-Smith et al. (2014) examine the appointment of new directors and find that the incidence of female appointments is significantly higher if the immediate predecessor was a female. Such evidence of a non-neutral director appointment process ties in with the notion of tokenism. If the only time female directors are appointed is to replace outgoing female directors, then, in the absence of regulations, the low fraction of female directors on corporate boards will persist over time.

Discriminatory gender bias in director appointments is likely to leave firms with a competitive disadvantage. Insofar as these are losses of efficiency due to discrimination in a competitive setting (Becker, 1957), but may also be the case if diverse teams outperform homogeneous teams (Kahane, Longley, and Simmons, 2013). Productivity gains from female representation on corporate boards can be manifest in better attendance of directors on the board, performance-sensitive CEO pay and CEO turnover, and generally better cor-

porate governance (Adams and Ferreira, 2009). A more gender diverse board may also be associated with improved decision making, the displacement of less able male directors and more efficient monitoring (see Hermalin and Weisbach, 2003; Adams, Gupta, Haughton, and Leeth, 2007).

In addition to the gains in governance outcomes, does female representation on corporate boards have an impact on firm performance? Empirical evidence suggests that board composition has no significant effect on firm performance and even that the effect of board gender diversity on firm performance can be negative (Larcker, et al. 2007; Adams and Ferreira, 2009; Ahern and Dittmar, 2012; Gregory-Smith et al. 2014). Gul, Srinidhi, and Ng (2011) find that female representation on boards improve stock price informativeness through increased public disclosure. However, these results are typically based on either studies of boards with only one female director or mandatory enforcement of regulations on female board representation. Thus, these results could capture the effect of tokenism, rather than the causal impact, of female representation on firm performance.

The majority of studies on female representation on corporate boards uses samples of US firms (Adams and Ferreira, 2009; Gul, Srinidhi, and Ng, 2011; Torchia et al. 2011). Little empirical evidence exists from European nations [see Gregory-Smith et al. (2014) for the UK and Ahern and Dittmar (2012) for Norway]. European firms differ from US firms in that a larger proportion are family-controlled in Europe, a lower prevalence of dual-class shareholding, and the existence of tiered boards (Faccio and Lang, 2002).

3 Data

3.1 Data source

The primary database used in the analysis is BoardEx, which provides information on board composition and director networks for listed European firms. We use a sample of EuroTop 100 firms for the period 2004-2013.¹ EuroTop 100 are the largest firms, in terms of market capitalisation, listed in any of stock exchanges of the European Union. Firms that appear at least once in the EuroTop 100 are followed until the end of the sample period as long as they remain listed. The sample firms are drawn from eleven western European countries: Belgium (5), Denmark (7), France (24), Germany (21), Italy (10), Netherlands (13), Norway (3), Spain (11), Sweden (4), Switzerland (14), and the United Kingdom (40). We use information on individual directors on the boards of these firms. We drop observations on individual directors observed in only one period in a given firm. We augment this database with a range of financial performance metrics using Datastream. Firms with unavailable financial performance metrics were excluded. The final sample consists of an unbalanced panel of 152 firms with 16,647 director-year observations. Table 1 presents descriptive statistics for selected firm, board and individual director characteristics. A steady, albeit incremental, increase in female representation on European boards is evident over the last decade (see Figures 1 and 2 for our sample period). Also, the fraction of firms with at least 20% female representation on the board has increased over the sample period, but female representation on key governance committees has been relatively stable throughout. We use these variations in female representation on boards and the female representation on committees to investigate the central question regarding firm performance.

[Insert Table 1 and Figs. 1 and 2 near here]

¹We choose this sample period because of better coverage and consistency of BoardEx data.

About 30% of our sample are UK firms. In further extensions we differentiate between samples of UK-firms, and non-UK European firms, which allows us to compare our findings with respect to the evidence from UK firms. In the following subsections, we present details regarding the relative characteristics of the two samples. On average, UK firms are comparable in size to European firms, but with lower profitability and lower volatility of stock prices.²

3.2 Key variables and summary statistics

Females constitute 2,468 or 13.45% of our sample of directors.³ We use three measures of female representation: *Any Female*, *% Female Directors on Board*, and *% Female on Committees*. *Any Female* is a binary indicator of the presence of at least one female board member in a given firm-year. While only 25% of the sample firms in Adams and Ferreira (2009) have more than one female director, over 50% of our sample firms have more than one female director. *% Female Directors on Board* is the ratio of female directors to total directors expressed as a percentage. An average board in our sample has 18.68% female representation, compared with 8.5% in the US sample (Adams and Ferreira, 2009) and 5% in the UK sample (Gregory-Smith et al., 2014). *% Female on Committees* is the ratio of the combined number of female directors on three key committees (Audit Committee, Nomination Committee, and Remuneration Committee) to the total number of directors on these committees, expressed as a percentage. Committees specialize in narrowly-defined tasks. The number and functions of these committees vary across firms, and roles are sometimes combined. The Audit Committee focuses on the appointment of independent auditors and management of internal financial performance, the Nomination Committee recommends the appointment of new directors to

²In further analysis, reported in section 5.5., we use a sample of S&P 500 firms in an attempt to reconcile our results with existing US evidence.

³The comparable figures are 8.87% for the US (Adams and Ferreira, 2009) and 8.19% for the UK (Gregory-Smith, et al, 2014).

the board, and the Remuneration/Compensation Committee deals with compensation and benefits for executives. *A priori*, a director who sits on one or more of these committees is more likely to influence the governance mechanism through her influence on the proposals and decisions of these committees. The proportion of female directors on the three key committees is an important variable for our empirical strategy as it measures the extent to which female directors are integrated into the governance mechanism of the firm. A total of 1,136 or 46% of the female directors in our sample are members of at least one of the three governance committees.⁴ The proportional representation of female directors on committees is greater than that on the board. Conditional of being on the board, female directors of European firms have an even chance of being on at least one committee.

In Table 2, we compare firm-year and board-year characteristics for firms with at least one female director and firms without a female director. Firms with at least one female director are on average larger, perform better in terms of return on assets, and have higher stock price volatility. These findings suggest that female representation on corporate boards is associated with firm characteristics, and performance outcomes.

[Insert Table 2 near here]

In Figures 3 and 4, we show the proportion of females on the board and the proportion of females on committees for the samples of UK and non-UK European firms. Although both groups have similar female representation on corporate boards (13.33% versus 13.68%), female representation on committees of UK firms (33%) is significantly lower than that for non-UK firms (70%). A larger proportion of UK firms have at least 10% female directors compared with non-UK firms, but a larger fraction of non-UK firms have more than 20% and more than 50% female representation on governance committees. This highlights a possible

⁴ Proportion of women on committees for a sample of U.S. firms is 9.61% (Adams and Ferreira, 2009). In our data, only 14.19% of female directors are appointed to committees in the UK, and 12.72% in the US.

difference in the representation and the participation of female directors in the governance mechanism.⁵

[Insert Figures 3 and 4 near here]

The comparison of firms with and without female directors (Table 2) suggests that firm characteristics can influence female representation on corporate boards. We include a set of covariates such as firm size, profitability, and stock-price volatility to control for differences in firm characteristics. The association between board gender diversity and performance may vary with the choice of firm performance measure (Erhardt, et al. 2003; Smith et al. 2006). The primary measure of firm performance for our analysis is *Return on Assets (ROA)*. To test for robustness of the results, we use other standard measures of performance: Tobin's q approximated by market-to-book value ratio (*MTBV*) and *Returns on Equity (ROE)*. We control for risk in a firm's operational environment using the standard deviation of monthly stock returns over the previous 12-month period. The natural logarithm of annual sales is used to control for firm size.⁶ We also control for usual board characteristics: board size and board independence (percentage of independent directors on the board).⁷

The controls for director characteristics are the age of the directors, time in the current role and time on the board. The compensation schedule is similar for all directors. Whether nominal pay differences can have an impact upon the association between female representation and firm performance is not clear. Therefore we do not use the pay information in our empirical models. Summary statistics are presented in Tables 1 and 2.

⁵Existing studies use either contemporaneous female representation (Adams and Ferreira, 2009) or lagged measures (Gregory-Smith, et al. 2014). We choose to use lagged measures (one period) but stress that results are very similar if we use contemporaneous measures. These estimates are available upon request.

⁶We check for the robustness of the measure of firm size by $\log(\textit{Total Assets})$.

⁷In the case of two-tier boards, board size is the linear summation of the number of directors on both the management and the supervisory board. The definition of independent director varies marginally across countries. However, the basic remains that for a director to be considered independent, she will not be a current or a former employee, a relative of a sitting executive, or has business relations with the firm.

The selection of individual directors to boards, and on committees, as well as the directors' impact on firm performance could be driven by the skills and experience. We use time in the current role, time on the board and age of the directors as measures of proxies for skill.

4 Empirical methods

Our initial approach is to estimate variants of the following model which aims to provide evidence on the association between female participation and firm performance:

$$FirmPerformance_{it} = \beta_1 \%FemaleDirectorsonBoard_{it-1} + \gamma Z + \varepsilon_{it} \quad (1)$$

where β_1 captures the strength of association of female board representation and firm performance, and Z is a vector of all firm and director characteristics. Firm characteristics, performance, and female board representation can be co-determined. Therefore, all independent variables, including the measure of female representation on the board, are lagged by one period. Our main estimates focus on the proportion of the board that is female, but in subsequent we also examine the effect of having at least one female on the board.

Next, we investigate a possible route to impact on firm performance of female representation. We estimate the likelihood of an individual female director's appointment to key governance committees (Audit Committee, Nomination Committee, and Remuneration Committee). We examine how the network of female directors impacts upon their appointment to these committees, and through these appointments on firm performance. We estimate the following linear probability model for the likelihood of female directors being

appointed to committees⁸:

$$CommitteeAppointment_{it} = \alpha Female_{it} + \phi Z + v_{it} \quad (2)$$

The dependent variable is a binary indicator of a female director appointment to one or more of the key committees in a given firm-year. α is the linear probability of an individual female director being appointed to the committees and Z is a vector of all firm and director characteristics.

Finally, we test our central hypothesis that the appointment of female directors to key committees is associated with better firm performance. We investigate the impact of female representation on committees to firm performance:

$$FirmPerformance_{it} = \beta_2 \%FemaleDirectorsOnCommittees_{it-1} + \gamma Z + \nu_{it} \quad (3)$$

The estimate on β_2 reflects the impact of female directors on firm performance, conditional on their being appointed on the committees.

A key challenge to causal interpretation is that there may be omitted unobservable characteristics that simultaneously affect firm performance and the appointment of female directors, to both the board and to committees. We adopt a number of approaches to this problem. First, we use firm fixed effects to control for any time-invariant omitted variables whereby firms that vary in underlying productivity are more or less likely to appoint women. Second, we then further adopt an IV approach where we rely upon an instruments previously used in the literature: the fraction of male directors on the board of firm i who sit on other boards (firms other than i) with at least one female director (Adams and Ferreira, 2009;

⁸As a measure of robustness, we also estimate a probit model.

Gregory-Smith et al. 2014). The argument is that if male directors of the board of firm i have exposure to other boards with female directors, then they are more likely to appoint female directors to their own board. However this should not impact upon firm performance, except through the appointment of female directors on the board.⁹ Similarly, we attempt to control for endogeneity in the committee appointments by using the proportion of male members who sit on other boards with at least one female committee member.

Further, with the firm performance indicators likely to be serially correlated, we include the lagged dependent variable as a covariate and estimate specifications (1) and (3) by generalised method of moments (Arellano and Bond, 1991; Blundell and Bond, 1998). We use the two-step estimation with Windmeijer (2005) corrected standard errors.

5 Results and analysis

5.1 Female board representation and firm performance

In Table 3, we present estimates of the impact of female board representation on firm performance. In Column 1 we show the effect of the proportion of female directors on boards, lagged by one period, on firm performance (ROA). We progressively add firm-level and board-level characteristics in Columns 2 and 3 respectively, and then finally firm and year fixed effects in Column 4. In all the specifications, the proportion of female directors on board is positively associated with firm performance. To quantify the magnitude of these effects, a one standard deviation increase in the proportion of female directors increase ROA

⁹We test for robustness by using an alternate measure of connectedness: network size. BoardEx reports the network size of individual directors, which is equal to the number of other directors a given individual is related to. A relation between two individuals is established if they graduated in the same class, have worked in the same firm together; sat on the same boards at the same time, or share familial ties.

by 0.07 units, which is 18% of the standard deviation of *ROA*.¹⁰ This finding supports the idea that having more female directors on corporate boards can be value-enhancing. However, this result could be biased by the endogeneity in female representation and firm performance.

[Insert Table 3 near here]

To address the concern that the positive correlation between female directors and firm performance could be endogenous, we present in Table 4 the results for female board representation and firm performance using a range of approaches. In all the specifications, the dependent variable is *ROA*. In specifications (1) and (2) we present the ordinary least squares (OLS) and fixed effects estimates, respectively. A positive and significant association exists between *% Female Directors on Board* and firm performance. In specification (4), this association is large but marginally significant only at the 10% level. The positive association between firm performance and female board representation appears robust to our attempts to address issues of endogeneity.

[Insert Table 4 near here]

To further test the robustness of our results we use a different measure of female representation. In Table 5, we present estimates where *ROA* is the dependent variable. The measures of female representation used in the two specifications are *% Female Directors on Board*, and *Any Female* in a given firm-year. Some interesting insights emerge. Having one female director on board is negatively associated with performance, and the proportion of female directors is positively associated with performance. These results hint at the nature of tokenism in the appointment of female directors on boards.

¹⁰The economic impact is arrived at by multiplying the standard deviation of the proportion of female directors (14.489) with the coefficient on *%Female on Board_{t-1}* from Column 4 of Table 3 (0.005). The impact on mean performance is calculated using the ratio of the product and mean *ROA*.

[Insert Table 5 near here]

We use a range of firm performance measures to test the robustness of the results: *ROA*, Tobin's *q*, approximated by market-to-book value ratio, and *ROE*. The positive association between firm performance and the proportion of female directors on the board persists with all measures of performance. To economize space, these results are not presented.

Our results thus suggest that gender diverse corporate boards are associated with better firm performance, but the association weakens after controlling for firm characteristics. While some evidence exists of performance gains from female representation on corporate boards, the magnitude of the effect on firms is modest regarding any policy implications.

5.2 Committee assignments of female directors

A priori, a director who is a member of one or more of the key committees has greater influence on strategic choices made by the firm. We test whether the likelihood of female directors being on these committees is different from that of male directors, conditional on the proportion of females on the board. From a revealed preference stand-point, appointment to committees should reveal the quality of the directors, irrespective of their gender. The sample is restricted to only non-executive directors and firm-years with at least one of the three key governance committees. We present the results of linear probability models in Table 6. The key variable of interest is *Female*, an indicator for an individual director being female. The number of observations varies across specifications because not all firms in the sample have all three committees. The dependent variable in each specification is a binary indicator of an individual director on any of the three committees, and the individual committees. All specifications present linear probability estimates with firm fixed effects and year dummies, and standard errors clustered at the firm level.

[Insert Table 6 near here]

In Column 1 the dependent variable indicates if an individual director is a member of at least one of the three committees. In columns 2-4 the dependent variable indicates if an individual director is a member, respectively, of the Audit Committee, the Nomination Committee, or the Nomination Committee. Overall, the likelihood of female directors being appointed to any of the three committees is not statistically different from that of the male directors. The estimate on the *Female* indicator is negative but not significant at conventional levels. Unsurprisingly, female directors are more likely to be appointed to committees when the proportion of female directors on the board is high. Of the committees, female directors are only relatively more likely to be appointed to the Audit Committee. This is consistent with Adams and Ferreira (2009), who finds that female directors are over-represented in monitoring-related committees. The likelihood of female directors on the Nomination Committee is negative, but this is not statistically significant at conventional levels. Intuitively, the lower probability of female directors on the Nomination Committee could hint at a possible reason behind lower female director appointments. However, we cannot provide any definitive evidence on this.

5.3 Female committee representation and firm performance

We examine the performance hypothesis, i.e., female directors can influence firm performance through governance if she is a member of the key committees. In Table 7, we investigate the effect of female committee representation on firm performance. However, female committee representation could be mechanically correlated with the number of female directors appointed to the board. Therefore we control for the number of female directors on board. In Columns 1 and 2, we present the OLS, and fixed effects estimates of the proportion of female directors on committees on *ROA*. The issue of endogeneity in firm performance and

the appointment of female directors on key committees is a potential concern. To circumvent this, we use an instrumental variable approach and GMM in Columns 3 and 4, respectively. The instrument used in Column 3 is the proportion of male directors who sit on other boards with female directors on key committees. We include the number of female directors on the board to control for the mechanical association of board and committee membership.

In all the specifications, the proportion of female directors on key committees has a positive effect on firm performance. This effect on firm performance is of an order of magnitude higher than the effect of the proportion of females on the board. All other covariates retain their usual sign and significance.

[Insert Table 7 near here]

Our general finding is that the greater the integration of female directors in the functioning of the boards, the greater the performance gains from female representation. To quantify, a one standard deviation increase in the proportion of females in committees increases *ROA* by 0.59 standard deviation. Existing studies estimate only the impact of female representation (but not participation), which could partially explain their findings of zero or negative impact on firm performance of female board representation. The impact of female committee representation on firm performance is a novel result, highlighting the possible tokenism on boards in which female directors are not appointed to committees. In the presence of statistical gender discrimination, female directors are likely to be drawn from the higher end of the ability distribution of females. That appointing these high-ability individuals to the decision-making committees is performance enhancing possibly suggests a more general implication that the quality of the directors matter for firm performance.

5.4 Additional Results and Robustness

Approximately 30% of our observations are for UK firms. To ascertain whether our results are driven by the disproportionate presence of firms from one country, we run the baseline regressions separately for UK and non-UK European firms. The results are presented in Table 9. We provide results for both measures of board gender diversity: *% Female on Board*, and *% Female on Committees*. This exercise provides some interesting insights. First, the effect on firm performance of the proportion of female directors on the board is stronger for the non-UK sample and the parameter estimate for the UK sample is statistically insignificant. This is consistent with the results of Gregory-Smith et al (2014) that evidence on performance gains from board gender diversity is lacking for UK firms. This, combined with the large proportion UK firms in our main sample, suggests larger gender effects for non-UK firms.

[Insert Table 8 around here]

Second, the effect on firm performance of the proportion of female directors on key committees is stronger for the non-UK sample, but the parameter estimate for the UK sample is also both significant and positive. This reinforces our previous point that the traditional measures of board gender diversity do not reflect the degree of integration of the female directors in the governance mechanism.¹¹ The full economic benefits of female representation could be internalized by integrating them through committee appointments.

Finally, we compare the results with a sample of Standard & Poor's (S&P) 500 firms. The results presented in Columns 5 and 6 suggest that the proportion of female directors on boards and committees are negatively associated with firm performance. The smaller proportion of female directors on US boards (8.6%), and committees (12.7%) could be driving these

¹¹The regressions for Table 8 contain the full set of controls as the baseline regressions. In the interests of brevity, we report the estimates of only the key variables.

findings. Although the estimates are significant for the sample of US firms, the economic impact of both measures of female representation is weaker than our baseline estimates. One standard deviation change in the proportion of female directors on board (committees) leads to a 0.06 (0.11) standard deviation change in *ROA*.

Our results on the performance impact on firm performance of female representation are different from that of the existing evidence. This is possibly due to higher participation of female directors in the governance mechanism through their presence on the key committees. The UK and US evidence shows the impact of having (a few) female directors on the board compared to none, whereas we provide evidence of having a critical mass of female directors, and appointing them in key committees to influence governance, and performance.

We test the robustness of our results with alternate measures of firm performance: Market-to-Book Value (*MTBV*), and *ROE*. The results are presented in Columns 2 and 3 of Table 10. All specifications are estimated with firm and director-level covariates, but we report only the key variables. The estimates on *% Female on Board*, and *% Female on Committees* are qualitatively similar to the baseline estimates reported in Column 1.

[Insert Table 9 near here]

In the baseline specification, *% Female on Committees* is calculated as the proportion of female directors to the total number of director on committees. We use an alternate measure: proportion of female in committees, conditional on being on the board. We find a stronger association of female committee membership and firm performance. The results are available upon request.

We also construct other measures of diversity using the nationalities of independent directors, irrespective of their gender. We find similar performance-gains for appointing directors of other nationalities on the board, and committees.

To ensure that our results are not affected by idiosyncratic shocks from the financial crisis, we re-estimated our main models excluding observations from 2008 and 2009. The results with the reduced sample are qualitatively similar to those of the baseline estimates, but they are less precise. For the sake of parsimony, the tables are not presented here but are available upon request.

The sample of firms is drawn from eleven countries. It is conceivable that country-level characteristics, such as female participation in the labour force, culture, and family-friendly provisions, etc. could be predictors of both female representation on boards and firm performance. We estimate our baseline regressions with country fixed effects instead of firm fixed effects as a measure of robustness. The results are quantitatively similar to the baseline estimates. The results are omitted in the interests of brevity.

6 Conclusion

Although female representation on corporate boards is likely to remain a central theme of future governance reforms, there is no clear agreement on the likely economic benefits of such reforms. We provide evidence on a possible mechanism of impact on performance of board gender diversity. The results of this paper suggest that female representation on corporate boards is associated with enhanced firm performance, particularly when the female directors are appointed to key decision making committees.

More generally, no clear evidence emerges on how boards react to institutional pressures on board composition and whether board composition impacts upon firm performance. Boards can chose a compliance strategy of token female representation, or they can chose to be flexible in realising the benefits of appointing high ability individuals to decision-making committees. Appointment of female directors (and directors of other nationalities) to key

committees, not under institutional pressure, is an example of board flexibility. Our findings show that strategically flexible boards add value by appointing directors to decision-making committees, and that the composition of such committees affects firm performance.

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Table 1

Summary Statistics

The sample is an unbalanced panel of 18499 director-level observations from 118 firms for the period 2006-2013. Director level data are obtained from ExecuComp and firm level data are from Datastream. All variables are winsorized at the 1%-level. Tobin's q is approximated by the market-to-book value ratio (*MTBV*)

Variable	<i>N</i>	Mean	Std. Dev.	Minimum	Maximum
Firm Characteristics					
<i>Return on Assets</i>	16,647	6.643	6.108	-09.28	38.95
<i>Log Sales</i>	16,647	17.558	0.921	14.39	20.02
<i>Tobin's-Q</i>	16,647	2.866	5.792	-58.37	86.00
<i>Stock Price Volatility</i>	16,647	0.939	0.913	0.05	9.44
Board Characteristics					
<i>Board Size</i>	16,647	16.963	5.942	6.00	36.00
<i>%Independent Directors</i>	16,647	47.743	27.786	0.00	91.00
<i>Firm has Female Directors (%)</i>	16,647	91.087	28.493	0.00	100.00
<i>Firm has One Female Director</i>	16,647	17.49	37.99	0.00	100.00
<i>% Female in Board</i>	16,647	18.531	14.489	0.00	88.89
<i>% Female in Committees</i>	16,647	15.200	16.175	0.00	60.21
<i>Nomination Committee Size</i>	16,647	3.941	2.473	0.00	16.00
<i>Audit Committee Size</i>	16,647	4.208	1.461	0.00	8.00
<i>Remuneration Committee Size</i>	16,647	3.432	1.949	0.00	9.00
<i>% Non-native Directors</i>	16,647	12.614	18.330	0.00	48.25
<i>% Non-native Directors in Committees</i>	16,647	10.212	15.093	0.00	27.78
Director Characteristics					
<i>Time on Board</i>	16,647	5.756	5.269	0.00	54.90
<i>Time in Role</i>	16,647	4.535	4.238	0.00	47.72
<i>Executive Age (years)</i>	16,647	58.115	8.097	26.00	90.00

Table 2

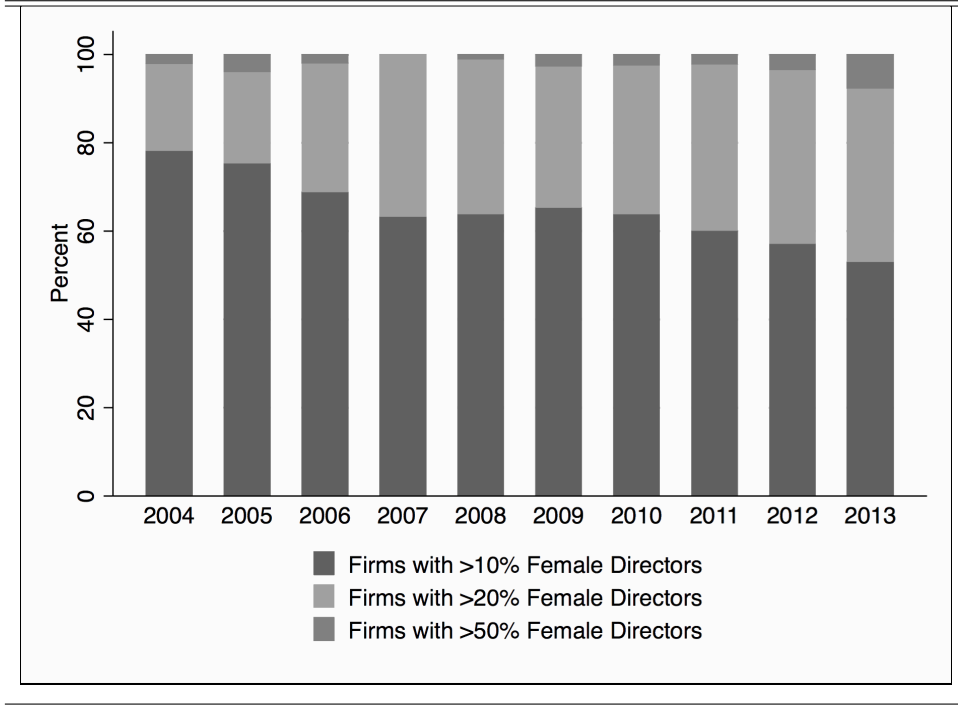
Comparisons of firms with and without at least one female director

This table presents key summary statistics for firm-years with no female directors and firm-years with at least one female director. Firms with no female directors are smaller and have smaller boards. No statistically significant difference in any other attributes. All variables are winsorized at the 1%-level. Tobin's q is approximated by the market-to-book value ratio (*MTBV*)

Variable	<i>No Female Directors mean</i>	<i>At Least One Female Director-Mean</i>	<i>p-value</i>
<i>Log Sales</i>	17.296	17.614	0.000
<i>Tobin's-Q</i>	3.025	2.819	0.272
<i>Return on Assets</i>	5.869	6.697	0.000
<i>Board Size</i>	15.140	17.152	0.072
<i>% Independent Directors</i>	47.109	47.811	0.011
<i>Executive Age</i>	59.035	58.013	0.000
<i>Nomination Committee Size</i>	3.849	3.950	0.066
<i>Audit Committee Size</i>	3.283	4.308	0.000
<i>Remuneration Committee Size</i>	3.541	3.420	0.010

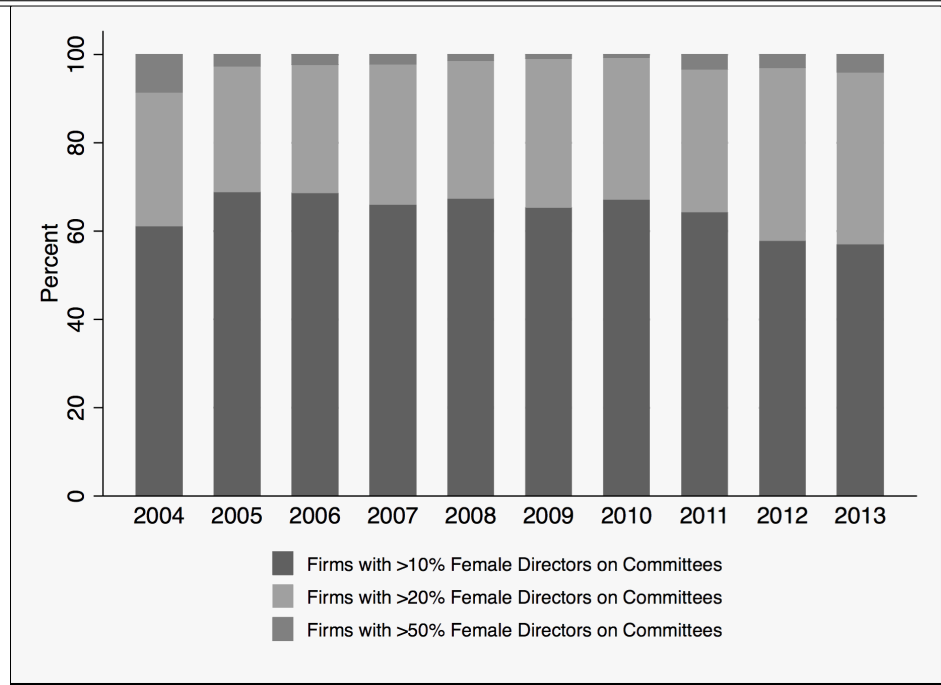
Figure 1: Yearly Trends in Board Gender Diversity

This figure shows the rise in female representation on corporate boards. There seems to be an increase in the proportion of firms with more than 20% female directors.



**Figure 2: Yearly Trends in Female Representation
on Governance Committees**

The fraction of female directors on key governance committees has remained relatively stable over our sample period.



**Figure 3: Female Representation on Boards:
UK vs Non-UK Firms**

This figure compares the female representation on boards of UK and non-UK European firms in our sample. A higher fraction of non-UK firms have 10% female directors, whereas a higher fraction of UK firms have over 50% female directors on board.

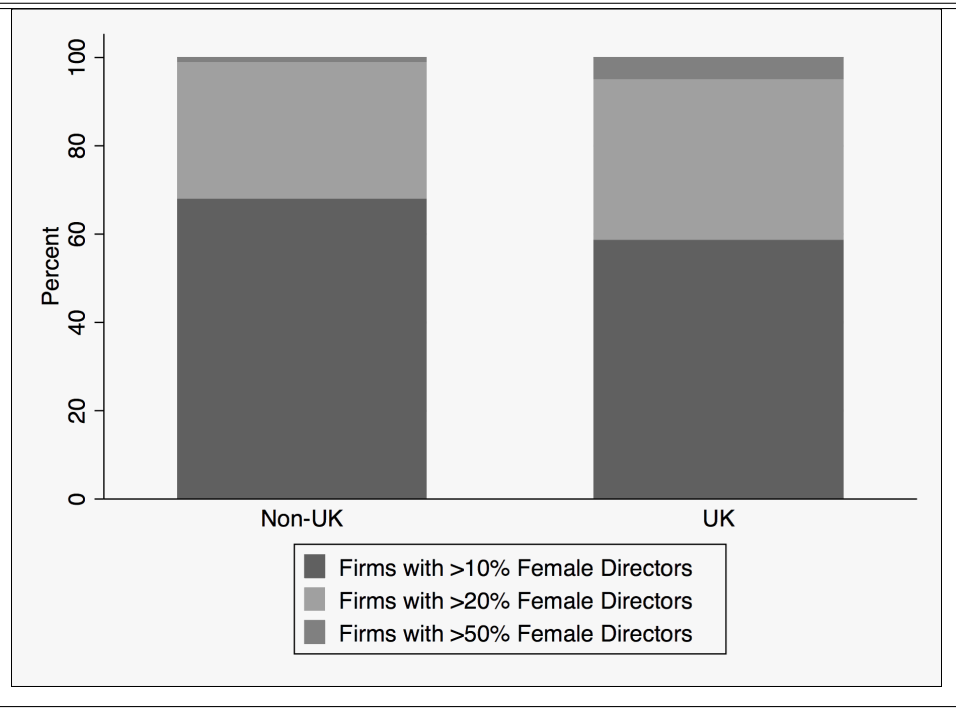


Figure 4: Female Representation on Governance

Committees: UK vs Non-UK Firms

This figure compares the female representation on key governance committees of UK and non-UK European firms in our sample. A higher fraction of non-UK firms have more female representation on governance committees.

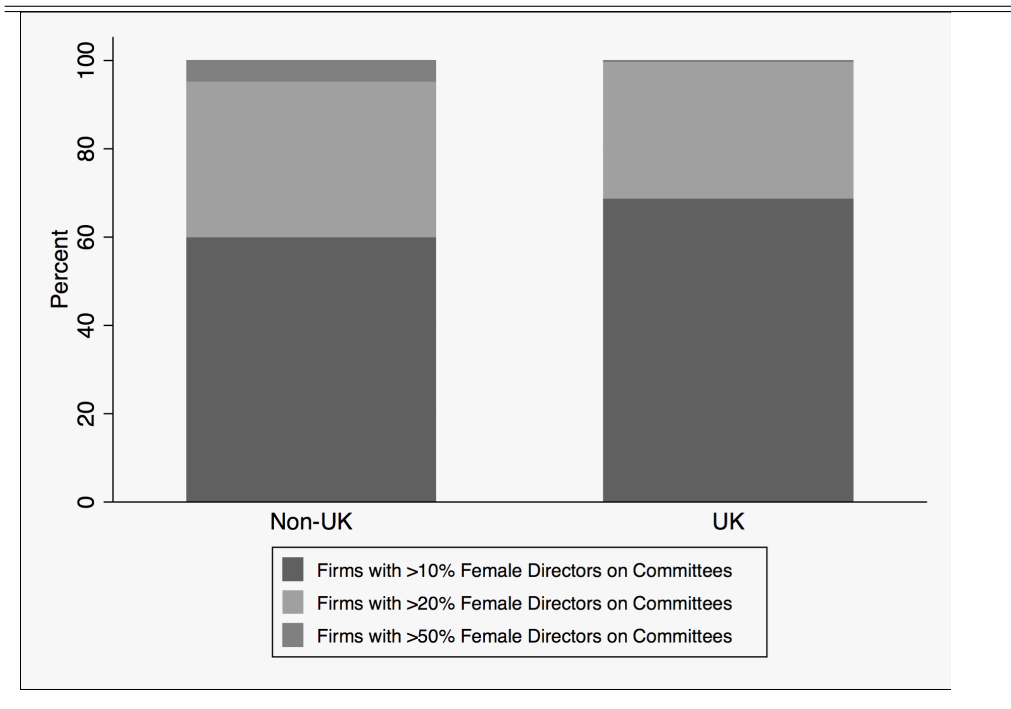


Table 3

Female representation on board and firm performance

This table presents the results of the impact on firm performance of female representation on boards: *%Female in board*. The dependent variable in all the columns is Return on Assets (*ROA*). In Column 1 we present the unconditional effect. In Columns 2 and 3 we add firm and board characteristics, and in Column 4 we add firm and year fixed effects. In all specifications, there is a positive association of female board representation on firm performance, but the effect weakens with addition of firm and board characteristics. Robust standard errors in parentheses. Asterisks indicate significance at 0.01 (***) , 0.05 (**) and 0.10 (*) levels.

Variable	<i>Dependent Variable: Return on Assets</i>			
	(1)	(2)	(3)	(4)
<i>% Female in Board</i> _{<i>t</i>-1}	0.052*** (0.003)	0.0428*** (0.003)	0.0148*** (0.003)	0.005** (0.002)
<i>Log Sales</i> _{<i>t</i>-1}		0.7290*** (0.0510)	0.3373*** (0.049)	0.033*** (0.007)
Stock Price		-0.2642*** (0.0076)	-0.2158*** (0.007)	0.000 (0.026)
<i>Volatility</i> _{<i>t</i>-1}			-0.4778*** (0.0102)	-0.016*** (0.003)
<i>Board Size</i> _{<i>t</i>-1}			0.066*** (0.002)	0.0757*** (0.015)
<i>% Independent Directors</i> _{<i>t</i>-1}			-1.689*** (0.989)	
<i>Chairman-CEO</i> _{<i>t</i>-1}				
<i>Constant</i>	5.008*** (0.804)	24.99*** (0.920)	28.69*** (0.884)	4.70*** (0.593)
Firm fixed effects	No	No	No	Yes
Year dummies	No	No	No	Yes
Observations	16.647	16,647	16,647	16,647
Adjusted <i>R</i> ²	4.15	10.58	19.76	20.80

Table 4

Female directors and firm Performance-Different Estimation Techniques

The results of the effect of female directors on firm performance are presented using different estimation techniques. The main variables of interest is *%Female in Board*. Column (1) presents the OLS estimates. Column (2) includes firm fixed effects. Column (3) presents Instrumental Variable (IV) estimates with proportion of male directors with outside directorships in firms with female directors as an instrument. Column (4) presents the results from Arellano-Bond one step regression (*GMM*). All specifications include year dummies. Robust standard errors in parentheses. ***, **, and * indicate significance at 0.01, 0.05, and 0.10 levels respectively.

Variable	<i>Dependent variable: Return on Assets</i>			
	OLS (1)	FE (2)	IV (3)	GMM (4)
<i>% Female in Board</i> _{t-1}	0.023** (0.003)	0.005** (0.002)	0.364*** (0.057)	10.98*** (0.044)
<i>Log Sales</i> _{t-1}	-0.300*** (0.049)	0.033*** (0.007)	0.580*** (0.163)	0.737** (0.306)
<i>Stock Price</i>	-0.206*** (0.007)	0.000 (0.026)	-0.103** (0.038)	-0.918** (0.483)
<i>Volatility</i> _{t-1}				
<i>Board Size</i> _{t-1}	-0.472*** (0.010)	-0.016*** (0.003)	-0.0301* (0.015)	-0.244** (0.095)
<i>% Non Executive</i>	-0.064** (0.002)	0.0757*** (0.015)	0.237** (0.079)	0.100 (0.141)
<i>Directors</i> _{t-1}				
<i>Constant</i>	26.98*** (0.898)	28.03*** (0.927)	31.98** (4.166)	46.77** (27.42)
Firm fixed effects	No	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	16,647	16,647	16,647	10,241
No <i>AR</i> (2)				0.329
Sargan Test				0.218
Adjusted <i>R</i> ²	25.50	20.80	26.21	

Table 5

Traditional Measures of Female Representation

This table presents the results of the impact on firm performance of female representation on boards using two different measures of female representation, viz.

%Female in board (1), *Any Female*: whether there is at least one female director in a firm-year (2). The impact of a token representation of female directors on ROA is negative but the association of proportion of female directors on board and firm performance is positive. All specifications include year dummies. Robust standard errors in parentheses. Asterisks indicate significance at 0.01 (***), 0.05 (**) and 0.10 (*) levels.

Variable	<i>Dependent Variable: ROA</i>	
	(1)	(2)
<i>Any Female</i> _{<i>t</i>-1}	-0.156* (0.059)	
<i>% Female in Board</i> _{<i>t</i>-1}		0.005*** (0.002)
<i>Log Sales</i> _{<i>t</i>-1}	0.033*** (0.007)	0.033*** (0.007)
<i>Stock Price</i>	0.000	-0.029
<i>Volatility</i> _{<i>t</i>-1}	(0.026)	(0.026)
<i>Board Size</i> _{<i>t</i>-1}	-0.016*** (0.003)	-0.015*** (0.003)
<i>% Independent Directors</i> _{<i>t</i>-1}	0.0757*** (0.015)	0.081*** (0.015)
<i>Constant</i>	48.03*** (0.927)	21.10*** (0.888)
Firm fixed effects	Yes	Yes
Year dummies	Yes	Yes
Observations	16,647	16,647
Adjusted <i>R</i> ²	20.80	29.28

Table 6

Assignment of Women Directors on Key Committees

This table presents the probability of individual female directors to be assigned to key governance committees-audit, nomination and remuneration. The main variables of interest are *Female* and *Female*%Female*. *Female* is a binary indicator for a female director. The results suggest that female directors are more likely to be chosen on any committees when the % of Female directors on the board is high. All estimates are from linear probability models with firm fixed effects and year dummies. Robust standard errors in parentheses. Asterisks indicate significance at 0.01 (***) , 0.05(**) and 0.10 (*) levels.

Variable	<i>Dependent Variable</i>			
	Any Committee (1)	Audit Committee (2)	Nomination Committee (3)	Remuneration Committee (4)
<i>Female</i>	0.098*** (0.011)	0.096*** (0.010)	-0.019** (0.009)	0.001 (0.009)
<i>Time in Role</i>	-0.0011 (0.000)	-0.001 (0.000)	-0.000 (0.000)	-0.002*** (0.000)
<i>Age (Years)</i>	0.010*** (0.0004)	0.004*** (0.000)	0.006*** (0.000)	0.006*** (0.000)
<i>Board Size</i>	-0.018*** (0.000)	-0.008*** (0.000)	-0.008*** (0.000)	-0.012*** (0.000)
<i>% Female in Board</i>	0.001*** (0.000)	0.001*** (0.000)	0.002*** (0.000)	0.001** (0.000)
<i>% Non Executive Directors</i>	0.000 (0.000)	-0.0007*** (0.000)	0.000 (0.000)	0.004** (0.000)
<i>ROA_{it}</i>	0.000 (0.000)	-0.000 (0.001)	-0.001** (0.000)	-0.002** (0.000)
<i>Log Sales</i>	-0.024** (0.004)	-0.013** (0.004)	-0.029*** (0.003)	-0.021** (0.003)
<i>Stock Price</i>	0.002*** (0.000)	0.000 (0.000)	0.001** (0.000)	-0.000 (0.000)
<i>Volatility</i>	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
<i>Network Size</i>	5.86e-04*** (5.10e-06)	9.01e-06** (4.29e-06)	4.24e-05*** (4.26e-06)	2.85e-06*** (4.28e-06)
Year dummies	Yes	Yes	Yes	Yes
Number of female directors	1,136	665	471	427
Observations	16,647	15,246	14,937	15,132

Table 7

Female Representation on Committees and Firm Performance

This table presents the results of GMM estimation of the impact of female representation on committees on firm performance. The Dependent variable in each specification is ROA. Standard error is reported in the bracket. Asterisks indicates significance at the 0.01 (***) , 0.05 (**) and 0.10 (*) levels.

Variable	<i>Dependent Variable: Return on Assets</i>			
	OLS (1)	FE (2)	IV (3)	GMM (4)
<i>% Female in Committees_{t-1}</i>	0.017*** (0.006)	0.015*** (0.002)	0.613*** (0.277)	2.23*** (0.582)
<i>y_{t-1}</i>				0.889*** (0.334)
<i>Log Sales_{t-1}</i>	0.419*** (0.049)	0.431** (0.052)	0.455*** (0.052)	0.787* (0.391)
<i>Stock Price Volatility_{t-1}</i>	-0.216*** (0.065)	-0.205 (0.169)	-0.219*** (0.101)	-0.424 (0.327)
<i>No. of Female Direct -ors on the Board</i>	0.183*** (0.025)	0.024* (0.014)	0.011* (0.006)	0.086 (0.045)
<i>Board Size_{t-1}</i>	-0.479*** (0.010)	-0.408** (0.008)	-0.410*** (0.012)	-0.644** (0.315)
<i>% Non Executive Directors_{t-1}</i>	0.064*** (0.002)	0.062** (0.002)	0.062** (0.002)	0.127 (0.130)
<i>Constant</i>	30.052*** (0.894)	29.18*** (0.999)	28.69*** (1.02)	38.65** (15.08)
Firm fixed effects	No	Yes	Yes	Yes
Year dummies	No	Yes	Yes	Yes
Adjusted <i>R</i> ² (%)	20.12	21.19	21.38	
Observations	16,647	16,647	16,647	9,642
No <i>AR</i> (2)				0.436
Sargan Test				0.334

Table 8

Comparison of UK, Non-UK and US Samples

This table presents the results of the impact on firm performance of female representation on boards for the UK and the non-UK sub-samples. Two measures of female representations are used: viz. %Female directors on the board (1) and (3), and % of Female directors on committees (2) &(4). The dependent variable in all specifications is ROA. The results suggest a stronger impact of female representation on firm performance for the non-UK sample. All specifications include year dummies Robust standard errors in parentheses. Asterisks indicate significance at 0.01 (***), 0.05(**) and 0.10 (*) levels.

Variable	<i>Dependent Variable: Return on Assets</i>					
	UK		Non-UK Europe		US	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>% Female in Board_{t-1}</i>	0.007 (0.004)		0.033*** (0.005)		-0.002** (0.001)	
<i>% Female in Committee_{t-1}</i>		0.011* (0.006)		0.037*** (0.003)		-0.001*** (0.000)
<i>Constant</i>	26.18*** (1.609)	26.095*** (1.621)	30.07*** (1.233)	29.414*** (1.262)	25.44*** (0.007)	24.76*** (0.007)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,794	5,794	10,580	10,580	28,843	28,843
Adjusted <i>R</i> ²	28.29	28.29	22.22	22.02	26.04	18.53

Table 9

Alternative Measures of Firm Performance

This table presents the results of the impact on firm performance of female representation on boards using three different measures of firm performance, viz. ROA, MTBV, and ROE. We report estimates for %Female on Board and %Female on Committees. All specifications include standard set of controls. Robust standard errors in parentheses. 0.01 (***) , 0.05 (**) and 0.10 (*) levels.

Variable	<i>Dependent Variable</i>					
	<i>ROA</i>		<i>MTBV</i>		<i>ROE</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>% Female in Board_{t-1}</i>	0.005*** (0.002)		0.005** (0.028)		0.054** (0.023)	
<i>% Female in Committee_{t-1}</i>		0.015*** (0.002)		0.023*** (0.003)		0.182*** (0.024)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,647	16,647	16,647	16,647	16,647	16,647
Adjusted R^2	20.80	21.19	18.65	20.00	26.32	29.28

Appendix

Variable summary and data description

In this table we describe the key variables and their sources. The variables are arranged under three broad categories: Firm Characteristics, Board Characteristics, and Director Characteristics.

Key Variables	Source	Description
Firm Characteristics		
<i>Return on Assets</i>	Datastream/Worldscope.	Net Income/Total Assets
<i>Sales</i>	Datastream/Worldscope.	Annual sales ('000 US\$)
<i>Tobin's-Q</i>	Datastream/Worldscope.	Market-to-Book value
<i>Stock Price Volatility</i>	Datastream/Worldscope.	Volatility in annual stock price
Board Characteristics		
<i>Board Size</i>	BoardEx/RiskMetrics	No. of directors on board(s)
<i>%Independent</i>	BoardEx/RiskMetrics	Fraction of independent directors
<i>% Female in Board</i>	BoardEx/RiskMetrics	Fraction of female directors on board
<i>% Female in Committees</i>	BoardEx/RiskMetrics	Fraction of female directors on committees
<i>Nomination Committee Size</i>	BoardEx/RiskMetrics	Directors on the nomination committee
<i>Audit Committee Size</i>	BoardEx/RiskMetrics	Directors on the audit committee
<i>Remuneration Committee Size</i>	BoardEx/RiskMetrics	Directors on the remuneration committee
<i>% Non-native Directors</i>	BoardEx/RiskMetrics	Board members who are of nationalities other than where the firm is listed
<i>% Non-native Directors in Committees</i>	BoardEx/RiskMetrics	Committee members who are of nationalities other than where the firm is listed.
Director Characteristics		
<i>Female</i>	BoardEx/RiskMetrics	Gender of the individual director
<i>Time on Board</i>	BoardEx/RiskMetrics	No. of years as a director on the board
<i>Time in Role</i>	BoardEx/RiskMetrics	No. of years in the current role
<i>Executive Age</i>	BoardEx/RiskMetrics	Age in years